




ENGINEER'S STICKER:				CONTRACTOR'S STICKER:			
1	As Built	VLS	RS	TRK	13-06-2022		
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A	Approval	VLS	RS	TRK	14-11-2021		
تنقيح REV.	سبب الإصدار ISSUED FOR	بواسطة PREPARED	راجعها CHECKED	وافق عليها APPROVED	التاريخ DATE		
 <p>رقم المشروع</p>		<p>المملكة العربية السعودية KINGDOM OF SAUDI ARABIA المؤسسة العامة لتحلية المياه المالحة SALINE WATER CONVERSION CORPORATION (SWCC)</p> <p>مشروع نقل مياه الجبيل الرياض - مشروع خزان الخرج JUBAIL - RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION</p>					
ENGINEER							
 <p>شركة الراشد للتجارة والمقاولات AL-RASHID TRADING & CONTRACTING CO. المقاول CONTRACTOR</p>		Al-Rashid Trading & Contracting Co.					
		<p>PLANT PIPING CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION</p>					
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SUB CONTRACTOR							

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Final Engineering			Contractor			Subcontractor			
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1. INTRODUCTION

Al Shaikh International Group for Cathodic Protection System Co. (Al Shaikh CP) / Bin Sari Specialized Technologies has been awarded the contract by M/s Al Rashid Trading & Contracting Co. to carry out cathodic protection works which includes site survey, cathodic protection design, engineering, material supply, installation supervision, testing and commissioning of station piping, tank bottom plates and tank internal cathodic protection system.

2. PURPOSE

This document outlines the material specification of Transformer rectifier units for permanent cathodic protection of station/plant piping. The structures to be cathodically protected shall be as per the following.

Technical details of structure:

Sl#	Description	Quantity	Diameter (m)	Length (m)	TR Rating
1	Station piping	01	0.7	277.20	10V/10A

Table-1

3. DEFINITIONS

COMPANY	:	Saline Water Conversion Corporation (SWCC)
EPC CONTRACTOR	:	Al Rashid Trading & Contracting Co.
CP CONTRACTOR	:	AL Shaikh International Group for Cathodic Protection (Al Shaikh CP) / BSS Technologies

Throughout this document the following terminology is used,

"shall"	:	The word "SHALL" is understood to be a mandatory to comply with the requirements
"should"	:	The word "SHOULD" is understood to be a mandatory recommended to comply with the requirements
"may"	:	Signifies a feature, which is discretionary in the context in which it is applied.

Final Engineering	Contractor	Subcontractor
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<div>4. ABBREVIATIONS</div> <div><div>A</div><div>:</div><div>Ampere</div></div> <div><div>AC</div><div>:</div><div>Alternating Current</div></div> <div><div>CP</div><div>:</div><div>Cathodic Protection</div></div> <div><div>CVCC</div><div>:</div><div>Constant Voltage Constant Current</div></div> <div><div>DC</div><div>:</div><div>Direct Current</div></div> <div><div>HRC</div><div>:</div><div>High Rupturing Capacity</div></div> <div><div>Hz</div><div>:</div><div>Hertz</div></div> <div><div>MCCB</div><div>:</div><div>Moulded Case Circuit Breaker</div></div> <div><div>ONAN</div><div>:</div><div>Oil Natural Air Natural</div></div> <div><div>P.S.P</div><div>:</div><div>Pipe to Soil Potential</div></div> <div><div>RCB</div><div>:</div><div>Residual Circuit Breaker</div></div> <div><div>Ph</div><div>:</div><div>Phase</div></div> <div><div>SS</div><div>:</div><div>Stainless Steel</div></div> <div><div>SCR</div><div>:</div><div>Silicon Control Rectifier</div></div> <div><div>V</div><div>:</div><div>Volt</div></div> <div><div>W</div><div>:</div><div>Watt</div></div>									
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<div>5. REFERENCE DOCUMENTS</div> <p>Cathodic protection system shall be designed in accordance with the requirements of the latest edition of following codes, standards and references.</p> <p>In case of contrasting requirements arising from the multiplicity of applicable documents, the following order of precedence shall apply:</p> <p><u>Project documents</u></p> <div><div>JK-DCPA-V4G02 Rev07</div><div>:</div><div>Project specification G02 - Description of project and works pipe laying and station construction works</div></div> <div><div>QC10-H-096 Rev07</div><div>:</div><div>Specification E16 – Cathodic protection</div></div> <div><div>JK-DCPA-M21 Rev0</div><div>:</div><div>Painting of Piping, Equipment and Structural Steel work</div></div> <div><div>01-QB10-R-402 RevA</div><div>:</div><div>Design Criteria for Cathodic Protection System</div></div> <div><div>49-QP10-S-303 RevA</div><div>:</div><div>Al-Kharj reservoir station general plot plan</div></div> <div><div>QC10-H-081 Rev6</div><div>:</div><div>Specification E01 - Design & construction of power supply systems</div></div> <p><u>International standards</u></p> <div><div>BS EN 12954:2019</div><div>:</div><div>Cathodic protection of buried or immersed metallic structures – General principles and application.</div></div> <div><div>BS EN ISO 15589-1</div><div>:</div><div>Petroleum, petrochemical and natural gas industries. Cathodic protection of pipeline systems. On-land pipelines</div></div> <div><div>NACE SP 0169</div><div>:</div><div>Control of external corrosion on underground or submerged metallic piping systems</div></div> <div><div>NEMA 250</div><div>:</div><div>Enclosures for electrical equipment (1000 volts maximum)</div></div> <div><div>API 651:2014</div><div>:</div><div>Cathodic protection of above ground petroleum storage tanks</div></div> <div><div>NFPA 70®:2011</div><div>:</div><div>National Electrical Code</div></div>									
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6. TECHNICAL DATA SHEET

6.1. Data Sheet for 10V/10A

A.C. input voltage	400 V \pm 10%, 3 Ph, 4 Wire, 60 Hz
A.C. Input Current	1 A (max.)
D.C. Power Output	100 W
Transformer	
Type	Double wound isolation
KVA rating	170 VA
Class	Class B
Dielectric strength	2.0 KV for 1 minute
Efficiency	> 95%
Regulation	3%
DC output voltage	0 to 10 V
DC output current	0 to 10 A
Factor of safety for diodes/SCRs	
Voltage	300% factor of safety
Current	300% factor of safety
Full load efficiency of rectifier	> 75%
Full load power factor	Not less than 0.8 lagging
Insulation level	2 KV for 1 minute
Cable entry	From the side of the TR unit through suitable cable glands following cable entry are available a) AC input b) DC output c) Reference cells

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Peak inverse voltage	
Diode	1200 V
SCR	1200 V
Filtering circuit	L.C. filter
Ripple & Hum	< 5% RMS at rated output
Surge diverters for diodes/SCRs	Metal oxide varistors / Capacitors / R-C networks
Lightning arrestor	At both AC input & DC output side of the TR unit RMS voltage rating : 500V RMS current rating : 5KA Type : LT 0.5 or Eqv.
Protection	a) 3 pole MCCB + RCCB in AC input b) HRC fuse in DC output Glass cartridge fuses in the live line of all auxiliary power lines to control circuit Fast acting electronic overcurrent limits circuit & short circuit protection for output.
Reference electrode	Facility for 3 nos. Cu/CuSO ₄ shall also be provided to select one out of three reference electrodes by means of a manually operated reference selector switch.
Control element	The DC output will be controlled using latest solid state SCRs. Full wave full controlled bridge rectifier. Thyristor / diodes mounted on the extruded heat sink. These SCRs will be controlled by the commands from the control circuits. All the electronic circuits will be assembled on plug-in type control cards.

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		Modes of operations				Following modes of control shall be provided a) Auto Ref. mode The operation of the unit in this mode will be fully automatic and will be controlled by the reference electrode feedback. The unit will automatically maintain reference voltage or pipe to soil potential within ±20mV of the set value under all conditions. b) CVCC mode This will be the second mode of operation. In this mode the unit can be operated in either constant voltage or constant current mode. In constant voltage mode the DC output voltage will be adjustable from 0 to rated values in step less manner by means of a voltage setter potentiometer. In constant current mode the DC output current will be adjustable from 0 to rated value in step less manner by means of a current setter potentiometer.			
		Remote monitoring				Following signals can be monitored through remote monitoring system a) TR unit output DC voltage b) TR unit output DC current c) TR unit AC voltage d) Instant Off Potential e) Cu/CuSO4 Reference Electrode			
		Reference fail safe feature				In the event of failure of the reference electrode, the DC output voltage of the unit will get to a preset value. This preset voltage is adjustable from 0 to rated voltage.			
		Reference (P.S.P) voltage setting range in auto reference mode				-0.8 V to -2.5 V			
		Reference regulation in auto mode				Better than ±20 mV			
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		Voltage setting range in CVCC mode				0 to 30 V			
		DC voltage regulation in CVCC (manual) mode				Better than ±0.5 V			
		Current setting range in auto mode & CVCC mode				0 to 30 A			
		Current regulation in current limit				Better than ±1.0 A			
		Indication / Annunciations				a) AC supply ON b) Under protection c) Over protection d) Reference fail e) Auto reference mode f) CVCC mode g) Current limit h) Phase reversal fault			
		Meters / instruments				72mm x 72mm analogue meters for the following: DC Voltage : 0 to 40 V DC DC current : 0 to 40 A DC with shunt 72mm x 72mm digital meter for the following P.S.P : 0 to ± 19.99 V DC			
		Current interruption				GPS current interruption facility will be provided by means of a built-in mercury relay & remote monitoring unit. 0.1 sec to 999 Hr. ON time & OFF time setting facility by digital key pad. Timer will have START & STOP facility through RS 485.			
		Cooling				Natural Oil Cooled (ONAN). Transformer oil to BS 148:1984 class 1 Quantity : 130 Liters			
		Enclosure / Construction				Floor mounted outdoor type arc resistance enclosure, fabricated from 2.5 mm steel sheet. Oil tank to be fabricated from 3mm steel sheet. Confirming to IP55 degree of protection.			
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Painting	Surface preparation by Shot Blast to SA 2.5. Inorganic zinc primer : 75 microns Polyamide epoxy : 125 microns Polyurethane top coat : 75 microns Total minimum DFT : 275 microns Finish color : RAL7035
Weight	300 kg (Approx.)
Earthing	2 nos. M12 earthing bolt shall be provided
Environment	Ambient temperature : 0-55 degree C Humidity : 95% RH maximum
Accessories	a) Oil inlet with plug b) Oil level gauge c) Oil drain valve d) Oil temperature meter indicator e) Breather with silica gel f) Removable canopy g) Rating plate h) Cover for the live parts (AC input, front AC side of the panel)

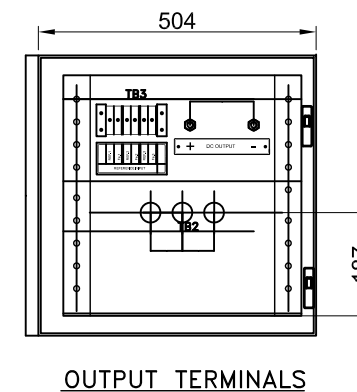
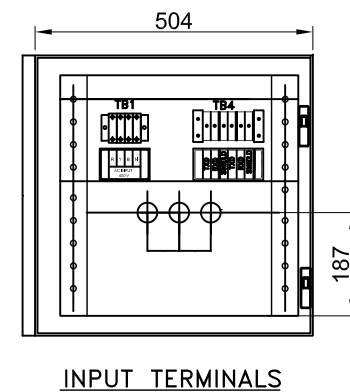
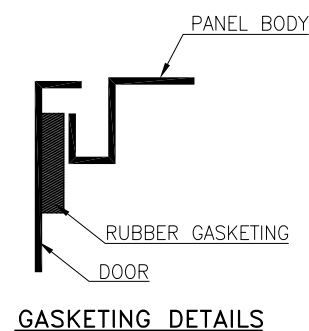
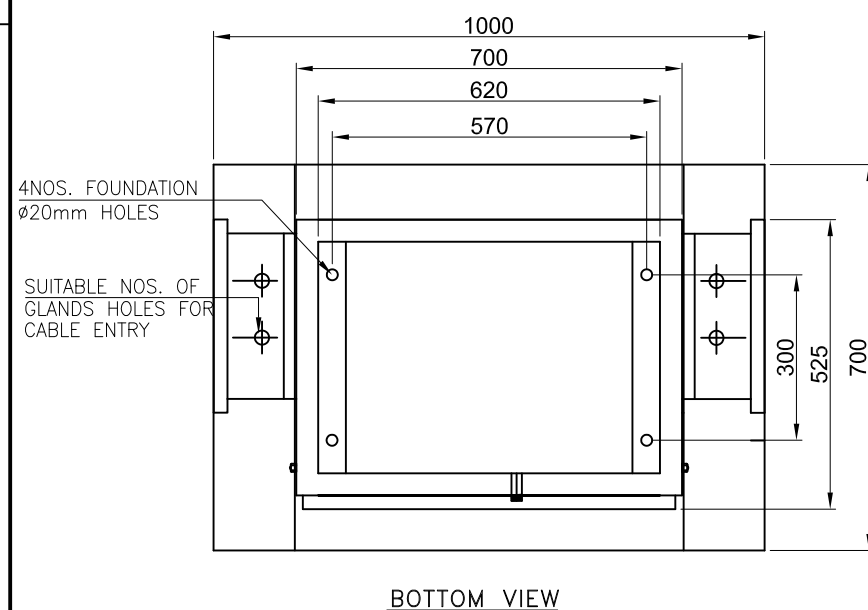
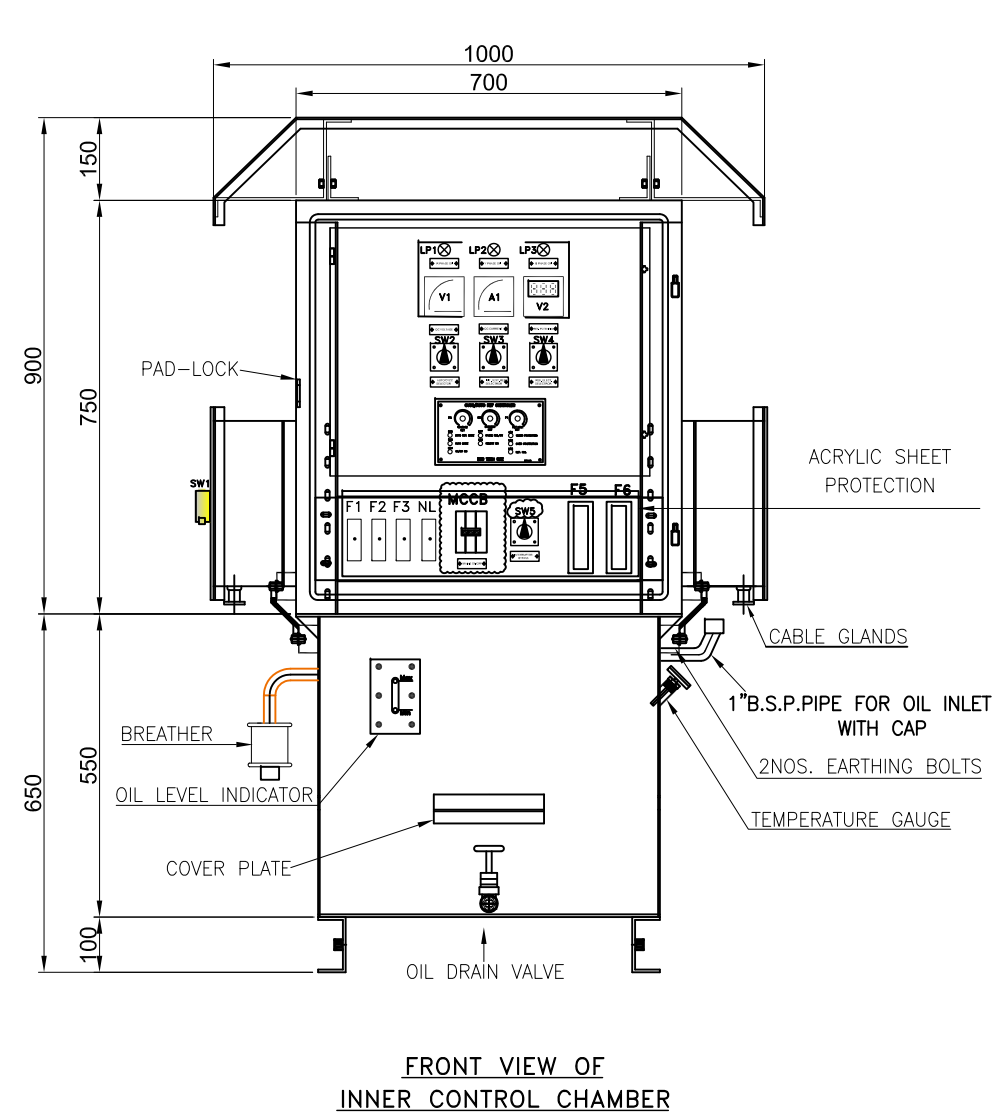
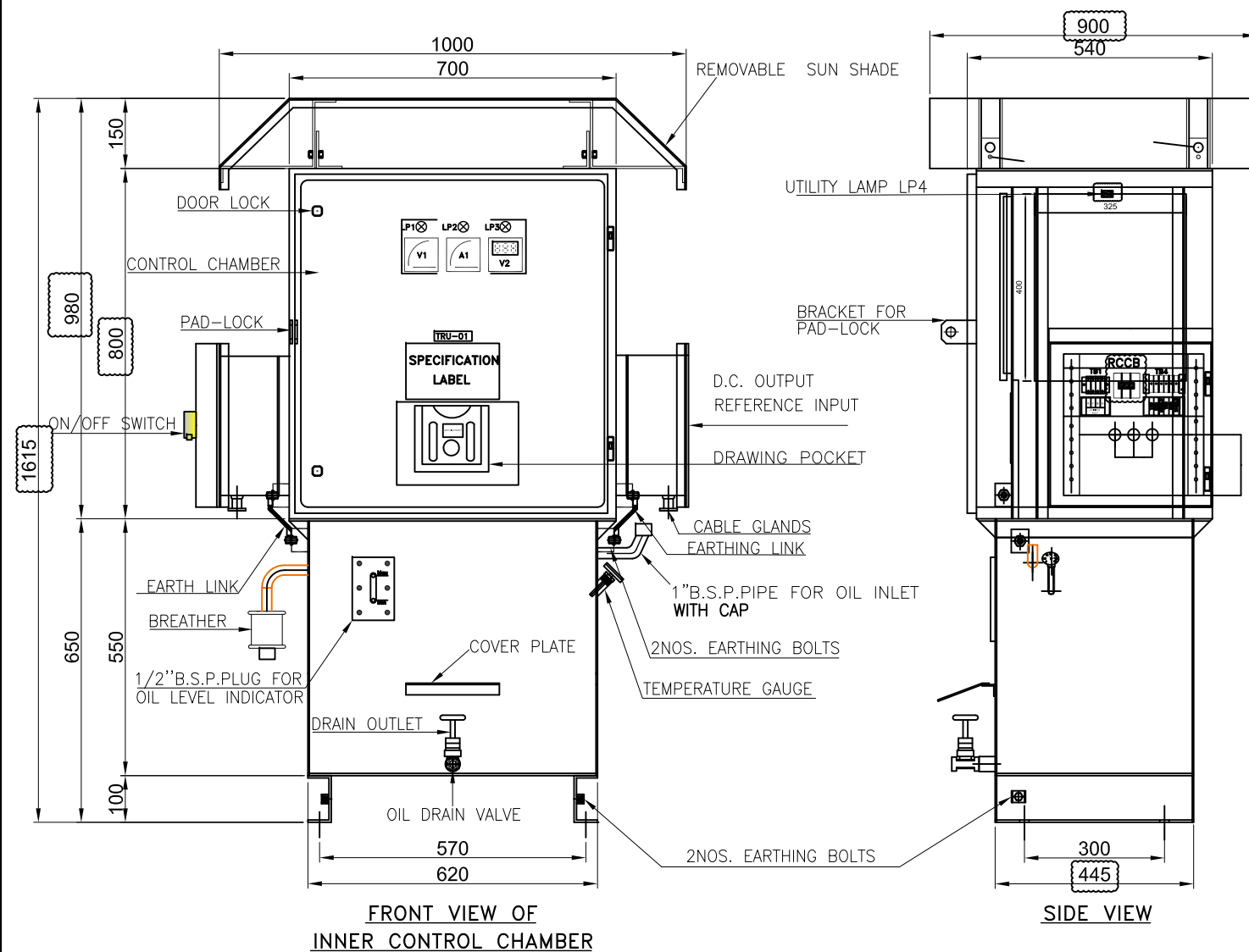
Final Engineering	Contractor	Subcontractor
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7. CIRCUIT & GA DRAWING

Final Engineering	Contractor	Subcontractor
	Al-Rashid Trading & Contracting Co.	Al Shaikh / BSS Technologies



ENCLOSURE DETAILS :-

THICKNESS OF OIL TANK	: 3.0mm
THICKNESS OF PANEL	: 2.5mm.
WEIGHT	: 280Kg APPROX WITHOUT OIL.
TYPE OF PROTECTION	: IP-55
FINISH OUTER	: RAL7035
FINISH INNER	: RAL7035
EARTHING BOLT	: M12 2NOS.
QTY. OF OIL	: 145 LITERS (APPROX.)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

LEGENDS:

LP1	MAINS ON INDICATOR LAMP FOR 'R' PHASE
LP2	MAINS ON INDICATOR LAMP FOR 'Y' PHASE
LP3	MAINS ON INDICATOR LAMP FOR 'B' PHASE
V2	REFERENCE VOLTAGE METER
P1	OUTPUT VOLT SETTER POTENTIOMETER
P2	CURRENT LIMIT SETTER POTENTIOMETER
P3	REFERENCE SETTER POTENTIOMETER
MCCB1	INPUT RCBO
MCCB1	MAINS ON/OFF MCCB
F1-F3	FUSES IN A.C. INPUT LINES
F5-F6	FUSES IN D.C. OUTPUT LINES
NL	NEUTRAL LINK
SW1	ON/OFF SWITCH
SW2	AUTO/CVCC SELECTOR SWITCH
SW3	AUTO / CVCC SELECTOR SWITCH
SW4	REF. ELECTRODE SELECTOR SWITCH
SW5	INTERRUPTER BYPASS SELECTOR SWITCH
V1	D.C. OUTPUT VOLTMETER
A1	D.C. OUTPUT AMMETER
V2	REFERENCE VOLTMETER
TB1	TERMINAL BLOCK FOR AC INPUT
TB2	TERMINAL BLOCK FOR DC OUTPUT
TB3	TERMINAL BLOCK FOR REFERENCE INPUT
TB4	TERMINAL BLOCK FOR REMOTE MONITORING AND CONTROL

REFERENCE DRAWING:	
DRAWING No.	TITLE

ENGINEER'S STAMP:	CONTRACTOR'S STAMP:
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1	AS BUILT	SKA	RS	TRK	13/06/2022
0	ISSUED FOR APPROVAL	SKA	RS	TRK	04/01/2022
A	ISSUED FOR APPROVAL	SKA	RS	TRK	14/11/2022
رقم ID#	وصف العمل BUILT OR ISSUED FOR	بواسطة BY	تمت CHECKED	الموافق عليه APPROVED	التاريخ DATE

Project No. 20SWG000041	المملكة العربية السعودية KINGDOM OF SAUDI ARABIA المؤسسة العامة للمياه المحلاة SALINE WATER CONVERSION CORPORATION SWCC
	جبريل نازح عورشم - ضابطة لبيب جلا قائم لئون عورشم JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION

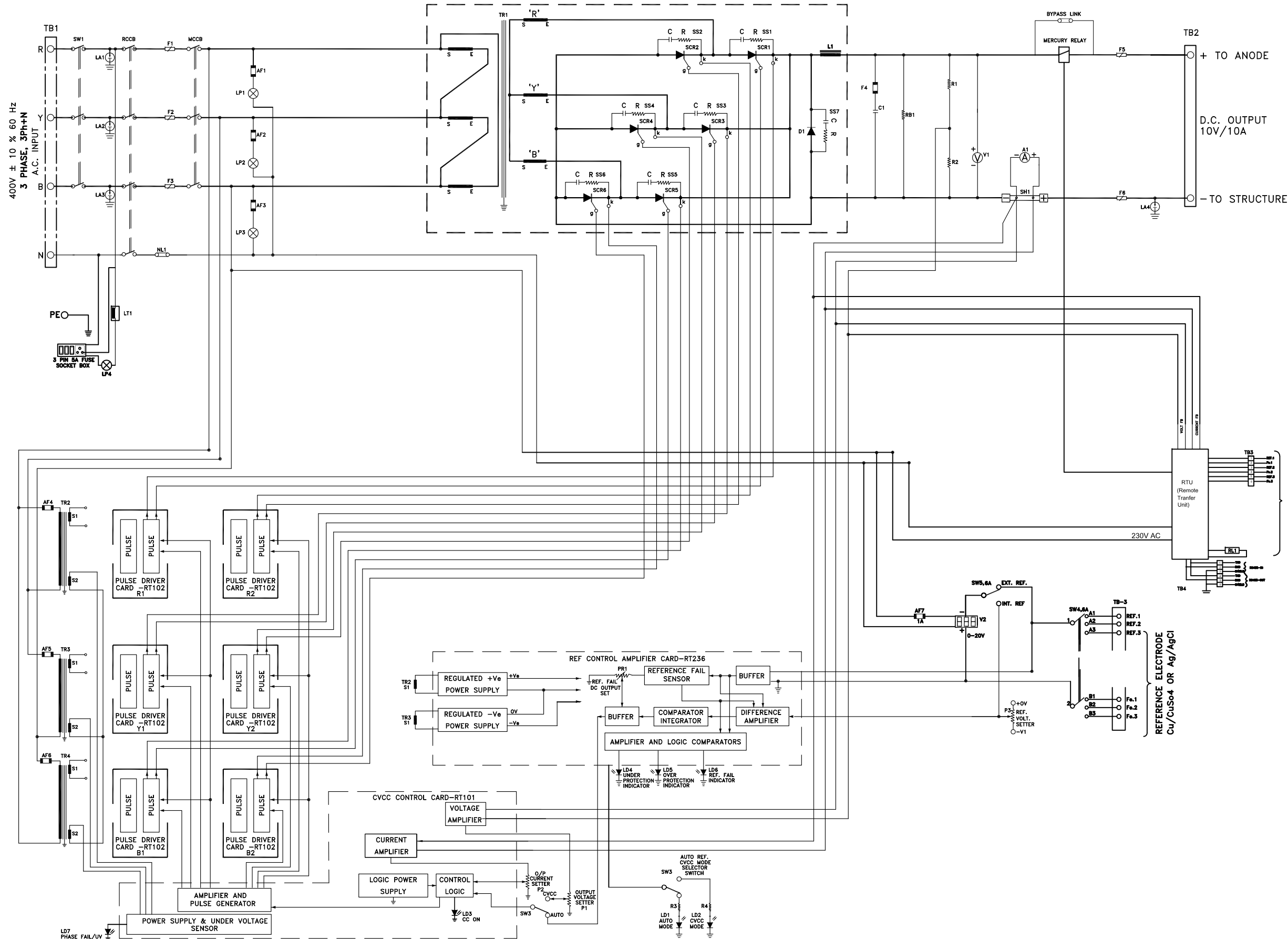
مهندس ENGINEER	
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 CONTRACTOR	 شركة الراشد للتجارة والمقاولات AL-RASHID TRADING & CONTRACTING CO.
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CP CONTRACTOR	 
SPECIALIZED IN CORROSION CONTROL & CATHODIC PROTECTION	

SCALE	PLANT PIPING CPS, TRANSFORMER RECTIFIER UNIT
NTS	TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION

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CP CONTRACTOR	BSST-DR-CPJ20206A-1-008		



CIRCUIT DIAGRAM FOR AUTOMATIC CONTROLLED T/R UNIT FOR CATHODIC PROTECTION
(OUTDOOR INSTALLATION TYPE) RATING:-10V/10A

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

- LEGENDS:
- LP1,2,3 MAINS ON INDICATOR LAMPS
 - LP4 PANEL ILLUMINATION LAMP
 - F1-F3 FUSES IN AC INPUT
 - NL1 NEUTRAL LINK IN AC INPUT
 - MCCB MAINS ON/OFF MCCB
 - RCCB RCCB AT MAIN INPUT
 - SW1 AC INPUT ON/OFF
 - LT1 LIMIT SWITCH FOR UTILITY LAMP
 - AF4,5,6 GLASS CARTRIDGE FUSE FOR AUX TRANSFORMER
 - AF1,2,3 GLASS CARTRIDGE FUSES FOR LAMP
 - AF7 GLASS CARTRIDGE FUSE REF. VOLT/METER
 - F4 GLASS CARTRIDGE FUSE FOR CAPACITOR C1
 - F5-F6 GLASS CARTRIDGE FUSE FOR DC OUTPUT
 - LA1-4 LIGHTNING ARRESTERS
 - TR1 MAIN TRANSFORMER
 - TR2-4 AUX. TRANSFORMERS
 - L1 D.C. FILTER CHOKE
 - V1 A.C. INPUT VOLT/METER
 - A1 A.C. INPUT AMMETER
 - V2 D.C. OUTPUT VOLT/METER
 - V3 REF. (P.S.P.) VOLT/METER
 - A2 D.C. OUTPUT AMMETER
 - SH1 SHUNT FOR D.C. AMMETER
 - RL1 RELAY FOR INTERRUPTION
 - CONT1 AIR BREAK CONTACTOR
 - P1 OUTPUT VOLTAGE SETTER POTENTIOMETER
 - P2 CURRENT LIMIT SETTER POTENTIOMETER
 - P3 REF. POTENTIAL SETTER POTENTIOMETER
 - SCR1-6 SILICON CONTROLLED RECTIFIER
 - D1 DIODE
 - SS1-7 SURGE SUPPRESSOR
 - RB1 RESISTOR BLEEDER
 - C1 CAPACITOR
 - LD1 AUTO REFERENCE MODE INDICATOR LED
 - LD2 CVCC MODE INDICATOR LED
 - LD3 CURRENT CONTROL ON LED
 - LD4 UNDER PROTECTION INDICATOR LED
 - LD5 OVER PROTECTION INDICATOR LED
 - LD6 REFERENCE FAIL INDICATOR LED
 - LD7 PHASE FAIL / UV INDICATOR LED
 - SW1 ON/OFF SWITCH
 - SW2 AUTO/MANUAL (CVCC) MODE SELECTOR SWITCH
 - SW3 REFERENCE ELECTRODE SELECTOR SWITCH
 - SW4 INTERNAL / EXTERNAL REF SELECTOR SWITCH
 - SW5 INTERRUPTER / BYPASS SELECTOR SWITCH
 - RT101 CVCC CONTROL CARD
 - RT236 REF. CONTROL AMPLIFIER CARD
 - RT102 PULSE DRIVER CARD
 - TB1 TERMINAL BLOCK FOR AC INPUT
 - TB2 TERMINAL BLOCK FOR DC OUTPUT
 - TB3 TERMINAL BLOCK FOR REFERENCE INPUT
 - TB4 TERMINAL BLOCK FOR REMOTE MONITORING AND CONTROL

DRAWING NO.	TITLE

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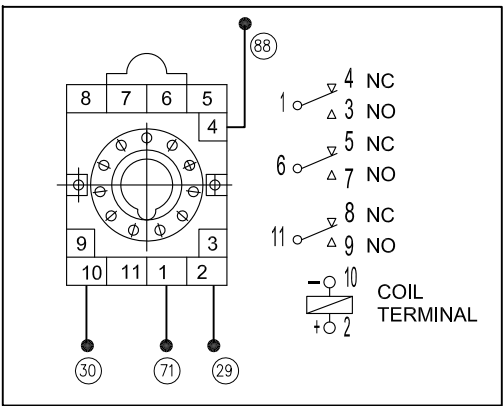
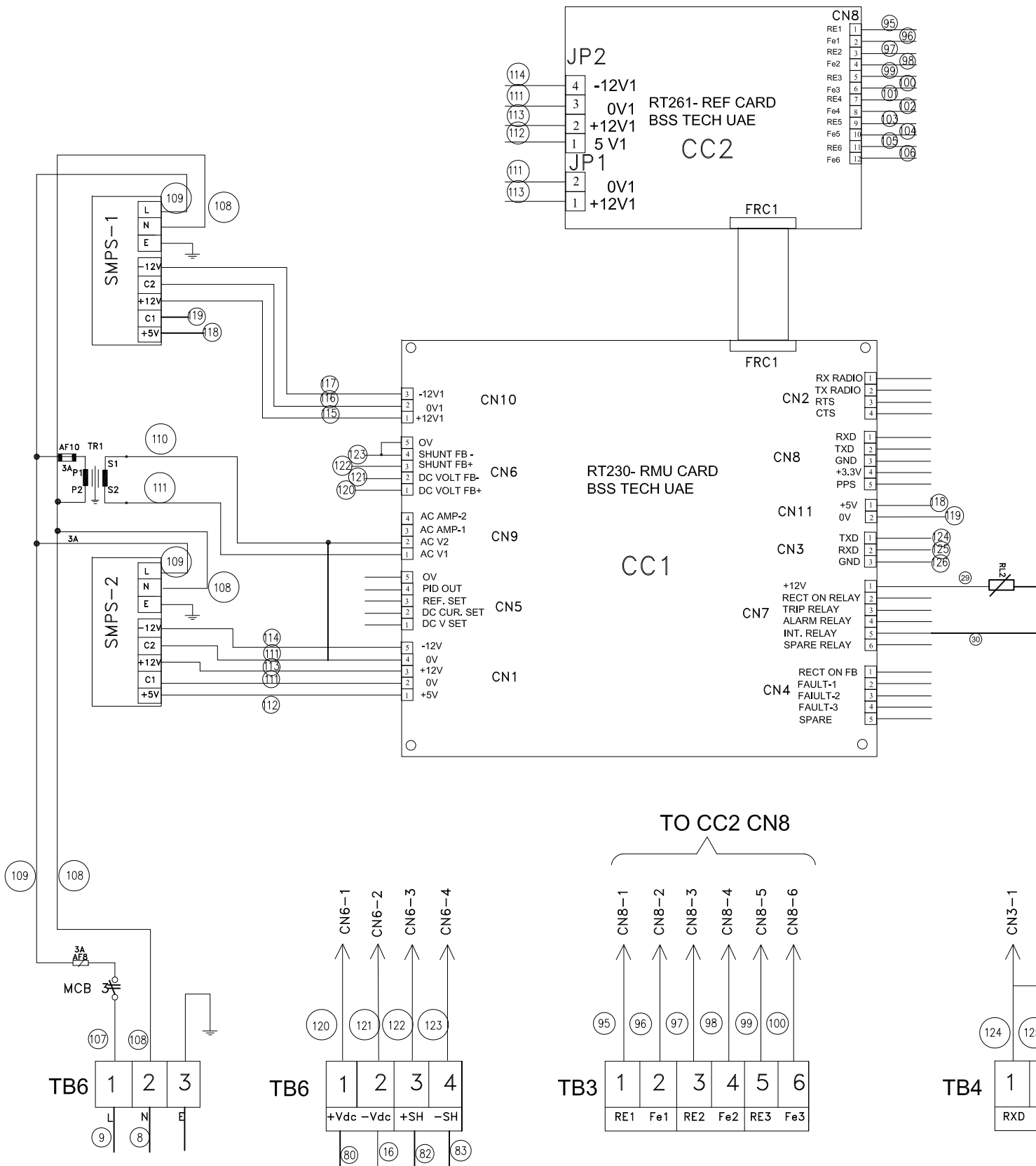
ENGINEER	
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CONTRACTOR	RTCC شركة الراشد للتجارة والمقاولات AL-RASHID TRADING & CONTRACTING CO.
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CP CONTRACTOR	AL-HAIKH SPECIALIZED IN CORROSION CONTROL & CATHODIC PROTECTION
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NTS	PLANT PIPING CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION
DRAWING NO.	SHEET REV.
049-QD00-H-0430	13 OF 18 1

CP CONTRACTOR	BSST-DR-CPJ20206A-1-008
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RL-1

AC INPUT SUPPLY

REFERENCE ELECTRODES

RS485 COMMUNICATION

WIRING DIAGRAM FOR AUTOMATIC CONTROLLED T/R UNIT FOR CATHODIC PROTECTION
(OUTDOOR INSTALLATION TYPE) RATING:-10V/10A

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

LEGENDS:

LP1,2,3 MAINS ON INDICATOR LAMPS
LP4 PANEL ILLUMINATION LAMP
F1-F3 FUSES IN AC INPUT
NL1 NEUTRAL LINK IN AC INPUT
MCCB1 MAINS ON/OFF MCCB
RCCB1 RCCB AT MAIN INPUT
SW1 AC INPUT ON/OFF
LT1 LIMIT SWITCH FOR UTILITY LAMP
AF4,5,6 GLASS CARTRIDGE FUSE FOR AUX TRANSFORMER
AF1,2,3 GLASS CARTRIDGE FUSES FOR LAMP
AF7 GLASS CARTRIDGE FUSE REF. VOLTMETER
F4 GLASS CARTRIDGE FUSE FOR CAPACITOR C1
F5-F6 GLASS CARTRIDGE FUSE FOR DC OUTPUT
LA1-4 LIGHTNING ARRESTERS
TR1 MAIN TRANSFORMER
TR2-4 AUX. TRANSFORMERS
L1 D.C. FILTER CHOKE
V1 A.C. INPUT VOLTMETER
A1 A.C. INPUT AMMETER
V2 D.C. OUTPUT VOLTMETER
V3 REF. (P.S.P.) VOLTMETER
A2 D.C. OUTPUT AMMETER
SH1 SHUNT FOR D.C. AMMETER
RL1 RELAY FOR INTERRUPTION
CONT1 AIR BREAK CONTACTOR
P1 OUTPUT VOLTAGE SETTER POTENTIOMETER
P2 CURRENT LIMIT SETTER POTENTIOMETER
P3 REF. POTENTIAL SETTER POTENTIOMETER
SCR1-6 SILICON CONTROLLED RECTIFIER
D1 DIODE
SS1-7 SURGE SUPPRESSOR
RB1 RESISTOR BLEEDER
C1 CAPACITOR
LD1 AUTO REFERENCE MODE INDICATOR LED
LD2 CVCC MODE INDICATOR LED
LD3 CURRENT CONTROL ON LED
LD4 UNDER PROTECTION INDICATOR LED
LD5 OVER PROTECTION INDICATOR LED
LD6 REFERENCE FAIL INDICATOR LED
LD7 PHASE FAIL / UV INDICATOR LED
SW1 ON/OFF SWITCH
SW2 AUTO/MANUAL (CVCC) MODE SELECTOR SWITCH
SW3 REFERENCE ELECTRODE SELECTOR SWITCH
SW4 INTERNAL / EXTERNAL REF SELECTOR SWITCH
SW5 INTERRUPTER / BYPASS SELECTOR SWITCH
RT101 CVCC CONTROL CARD
RT236 REF. CONTROL AMPLIFIER CARD
RT102 PULSE DRIVER CARD
TB1 TERMINAL BLOCK FOR AC INPUT
TB2 TERMINAL BLOCK FOR DC OUTPUT
TB3 TERMINAL BLOCK FOR REFERENCE INPUT
TB4 TERMINAL BLOCK FOR REMOTE MONITORING AND CONTROL
RT230 REMOTE MONITORING CARD
RT261 REFERENCE CARD

REFERENCE DRAWINGS:	
DRAWING NO.	TITLE

ENGINEER'S STAMP:		CONTRACTOR'S STAMP:	

REV.	REVISION	DATE	BY	CHECKED	APPROVED
1	AS BUILT	13/06/2022	SKA	RS	TRK
0	ISSUED FOR APPROVAL	04/01/2022	SKA	RS	TRK
A	ISSUED FOR APPROVAL	14/11/2021	SKA	RS	TRK

Project No: 20SWCG00041

المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA
المؤسسة العامة للمياه العذبة
SALINE WATER CONVERSION CORPORATION SWCC
جرجان نازح يوردرم - خياوردا ليريجان قارم لوت يوردرم
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION

مهندس
ENGINEER

مقاول
CONTRACTOR

RTCC
AL-RASHID TRADING & CONTRACTING CO.

CP CONTRACTOR
AL-HAIKH
SPECIALIZED IN CORROSION CONTROL & CATHODIC PROTECTION

NTS
PLANT PIPING CPS, TRANSFORMER RECTIFIER UNIT
TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION

DRAWING NO.	SHEET	REV.
049-QD00-H-0430	15 OF 18	1

CP CONTRACTOR
BSST-DR-CPJ20206A-1-008

KINGDOM OF SAUDI ARABIA							Sheet : 16 of 18	
SALINE WATER CONVERSION CORPORATION							Document Number	
JUBAIL TO RIYADH WATER TRANSMISSION SYSTEM AL KHARJ RESERVOIR STATION								
Subject:		PLANT PIPING CPS, TRANSFORMER RECTIFIER UNIT TECHNICAL SUBMITTAL AT AL KHARJ RESERVOIR STATION					49-QD00-H-430	
Revision Index	First Issue	Rev.	A	0	1			
		Date	14.11.21	04.01.22	13.06.22			
<div> <div>8. DATA SHEETS</div> <div>Transformer Oil</div> <div>As per the following product catalogue.</div> </div>								
Final Engineering			Contractor			Subcontractor		
			Al-Rashid Trading & Contracting Co.			Al Shaikh / BSS Technologies		

PRODUCT INFORMATION

DESCRIPTION

National Transformer Oils are developed from Napthenic Base Oils having excellent Electrical properties to meet British Standards and related specifications for Electrical Insulating Oil.

PERFORMANCE LEVELS

Meets

International Electro Technical Commission Standard - IEC 60296 (2003) - Uninhibited

FEATURES

- ◆ Ensures good insulation of Electrical Conductors
- ◆ Prevents arcing between Electrodes
- ◆ Minimizes dielectric loss
- ◆ Effectively cools Transformer Coils
- ◆ Provides long service life
- ◆ Very high oxidation stability and outstanding reliability during prolonged service.

APPLICATIONS

Recommended for Electrical Insulating Oil applications such as Transformers & Oil immersed switchgear where an oil meeting BSI, IEC or other comparable specification is required by the equipment manufacturer or user.

TYPICAL CHARACTERISTICS

Property	Test Method	Limits	Typical Values
<u>1. FUNCTION:</u>			
1 Viscosity, mm ² /sec			
@ 40°C	ISO 3104	Max 12.0	8.50
@ -30°C	ISO 3104	Max 1800	300
2 Pour Point, °C	ISO 3016	Max -40	-45
3 Water Content, mg/Kg	IEC 60814	Max 30	15
4 Break down voltage, kV	IEC 60156	Min. 30	65
5 Density, g/ml @ 20 °C	ISO 3675	Max. 0.895	0.863
Density, g/ml @ 29.5 °C			0.858
6 DDF at 90 °C	IEC 60247	Max. 0.005	0.0005
<u>2. REFINING/ STABILITY</u>			
1 Appearance	-	Clear, free from sediments and suspended matter.	Clear, free from sediments and Suspended matter.

The above figures are typical figures with normal production tolerance.

PDS/Rev03/01

PRODUCT INFORMATION

TYPICAL CHARACTERISTICS

Property	Test Method	Limits	Typical
2 Acidity, mg KOH/g	IEC 62021-1	Max. 0.01	0.0012
3 Interfacial Tension, mN/m	ISO 6295	No general requirement	46
4 Total Sulphur Content	BS 2000 Part 373 or ISO 14596	No general requirement	-
5 Corrosive Sulphur	DIN 51353	Not-Corrosive	Not-Corrosive
6 Antioxidant Additives	IEC 60666	Not detectable	Not detectable
7 2-Furfural content	IEC 61198	Max. 0.1 mg/kg	Nil

3. PERFORMANCE:

1 Oxidation Stability	IEC-61125 (Method C) Test Duration: (U) Uninhibited Oil: 164 h		
a) Total acidity, mg KOH/gm		Max. 1.2	0.54
b) Sludge, %		Max. 0.8	0.21
c) DDF at 90 °C	IEC 60247	Max. 0.5	0.06
2 Gassing	IEC 60628, A	No general requirement	-

4. HEALTH, SAFETY and ENVIRONMENT:

1 Flash Point, °C	ISO 2719	Min. 135	148
2 PCA Content	BS 2000 Part 346	Max. 3.0	0.25
3 PCB Content	IEC 61619	Not detectable	Not detectable

HANDLING, HEALTH AND SAFETY

Lubricant consisting of highly refined mineral oils with specific additives. In normal conditions of use this lubricant presents no particular toxic hazard. All lubricants, of any kind should be handled with great care, particularly avoiding any contact with the skin.

Prevent any splashing and keep away from combustible materials. Store under cover and away from any risk of pollution. Disposes off the used oil correctly, don't pour down drains, into watercourses or the soil.

The above figures are typical figures with normal production tolerance.